

## CANNIBALISM AND SURVIVAL RATE OF JUVENILE SOLIFUGAE (ARACHNIDA)

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### ABSTRACT

Cannibalism is a common act in the members of class Arachnida. After hatching from the eggs, juvenile Solifugae begin to disperse gradually away. This is essential to avoid competition for food, space and prevent cannibalism among the ravenous siblings. Two adult females (*Galeodes fatalis*) reared in captivity in start of summer season from rural Alirajpur, Madhya Pradesh. Both the females were mated and deposited eggs almost simultaneously in laboratory. The hatchlings remained with mother Solifugae for a week and then were divided in groups. Two groups each of 125 hatchlings of Solifugae were studied to compare survival rate in group and in isolation. In each group, two sub-groups of 50 hatchlings each were kept in two glass terrarium and 25 in plastic bottles individually. Out of the 25 juveniles kept in bottles 5 were also provided with tree bark shed for hiding or avoiding sunlight. The number of juvenile Solifugae in plastic bottles remained unchanged past one month of separation as there was no competition in isolation. However, due to higher rate of competition and innate cannibalism there was a significant change in number of Solifugae in terrarium enclosures. Their number dropped by 15% in the first week of separation to 21% in the second week. No juvenile could survive 30 days past separation in all four terrarium. This study describes the severity of cannibalistic nature of Solifugae in a group at the same time, also emphasizes on increased survivorship by dispersal in nature. During this study, juvenile *G. fatalis* were reared in laboratory conditions for 6 months and adults for 10 months.

**Key words:-** Solifugae, *Galeodes fatalis*, cannibalism.

### INTRODUCTION

Few animals have evolved and preferred social life instead of gregarious life. In Arachnids, few hundred species of spiders live in colonies. The advantage of a social spider over non social arachnids is web repairing, repel invaders, catch prey, feeding and protection of eggs and spiderlings. Non social animals like solifugae have evolved extreme aggressive behavior to protect themselves from prey.

Cannibalism is ubiquitous in animal kingdom but is frequent in systems where population densities are high and food is unavailable. Sibling cannibalism entails a high risk of direct and inclusive fitness loss for the mother and her offspring (Schausberger & Hoffmann, 2008). Many adaptations are evolved in animals to reduce the intraspecific cannibalism. Early dispersal of the sibling after the hatching is one of them.

Newly hatched larvae of *G. fatalis* larvae have poorly developed appendages (Figure 4.1). They remain essentially immobile until they molt to the first nymphal instar after two days of hatching (Figure 4.2). First instar nymphs take nourishment from the yolk sac in their abdomen. The nymphs are gregarious and remain together in the birth chamber

(Muma, 1966a). After a week, juvenile begin to disperse gradually away in nature. For protection, they dig a burrow or find a disguise in natural crevices. During growth, they moulted eight times (Figure 2). During each moulting, they became sequestered and fasted at least for a week prior to a moult (Figure 3F). This period of unconsciousness was very risky. The eyes became opaque and the legs of a juvenile rested in the dorsal side. The body showed little lateral movements on disturbance. They could be very easily predated in this vulnerable condition.

Similar observations were made by (Punzo, 1998). In terrarium enclosures, even after the ample food (Figure 3E), was made available the juveniles fed voraciously. As the juveniles started growing, they became highly active predators, utilized their large chelicerae for feeding and defense. Very soon the regular fights and injury separated the fittest instars from the unfit. But the innate fighting capabilities and critical period of inactivity for one week during moulting made them very vulnerable to be killed by siblings in terrarium. In this way, not only adults but, instar of solifuges have also been observed to eat each other.

#### MATERIALS AND METHODS

The geographic distribution and systematics of the Indian Solifugae was first studied long back in 1842 during British India. The present status of the solifugae is poorly known. The solifugae (*Galeodes fatalis*) were collected from the rural area of the district Alirajpur. It lies in the Malwa region of Madhya Pradesh, near the border with Gujarat and Maharashtra. Alirajpur's topography is predominantly hilly with semi-arid climate.

Total of 41 adult *G. fatalis* collected 07 were male and 34 were female. All were collected during day by turning stones and pitfall traps. All the specimens were kept in separate plastic bottles having a soil budding from the same region. They were provided with water in mineral bottle caps. Males were identified by the presence of a pair of flagellum (Figure 4.9) on the rostrum and females were identified by the development of the genital opening. All the *G. fatalis* were fed *ad libitum* with Grass hoppers, Caddis and Dragonflies. All inseminated females were kept in isolation (Figure 3B).

#### RESULTS AND DISCUSSION

Both the females laid eggs almost simultaneously after 27 days in laboratory condition. Female remained in the nest and guarded their eggs as well as post embryos and first instar nymphs (Figure 3D).

The hatchlings remained with mother Solifugae for a week and then were divided in groups. Two groups each of 125 hatchling of Solifugae were studied to compare survival rate in group and in isolation. In each group two sub groups of 50 hatchlings each were kept in two glass terrarium and 25 in plastic bottles individually with sand (as natural condition). Live grasshoppers were captured by net & offered to juveniles. Regular monitoring required for determining the survival rate of juvenile Solifugae.

They tried to biting everything which comes closer to them. When they were given a condition in which many siblings were kept together, even though plenty of food was made available, they showed destructive and barbaric characters.

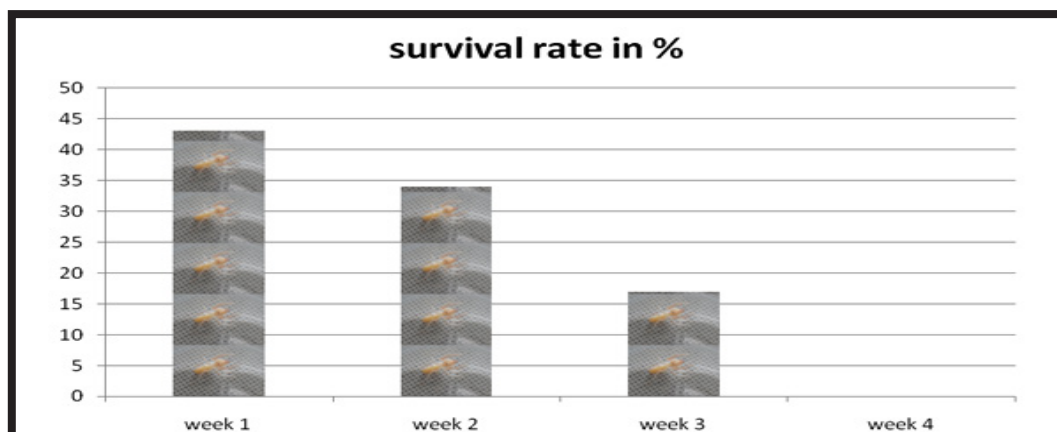


Figure 1: Survival rate of juveniles *G. fatalis* in the terrarium.

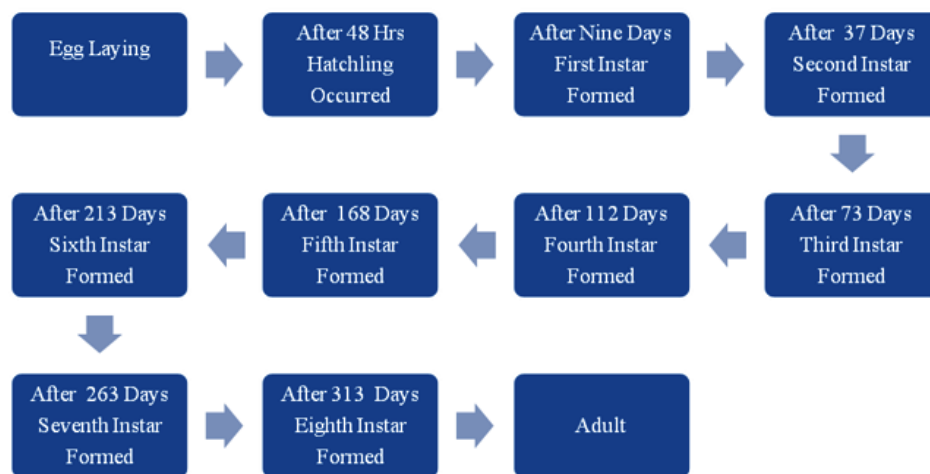


Figure 2: Post embryonic development stages of *G. fatalis* in laboratory condition.

Those nymphs which underwent moulting were severely affected as they were immotile and were eaten up by other siblings which were delayed in moulting. Their number dropped by 15% in the first week of separation to 21% in the second week. No juvenile could survive 30 days past separation in all four terrarium. Survived Solifugae also could not sustain life due to injuries in fight.

In nature, after hatching, juvenile Solifugae disperse by running away to longer distances and lead a solitary life. It enhances the survival rate of juvenile. Juveniles of *Galeodes fatalis* had strong sibling-cannibalism or intra-species killing.

In the first week, 15% mortality was observed i.e. out of 50 juveniles, so that 43 survived & 7 died. In the second week, the percentage of mortality was 21%. In the same manner, after the competition in third week, the survival rate was 49% i.e. 17 out of 34 juveniles. In 4<sup>th</sup> week, 100% mortality occurred i.e. no juvenile could survive.

When caged, fighting and cannibalism were more common (e.g. Muma, 1966b, Cloudsley-Thompson, 1977). After maturation, they spend few minutes when they happen to meet a mature female for mating. During copulation, the male seized the female and by mechanical means brought female to a passive state. Then spermatophore was picked up with its chelicerae and deposited it in her genital orifice (Figure 3A), and leaped away.

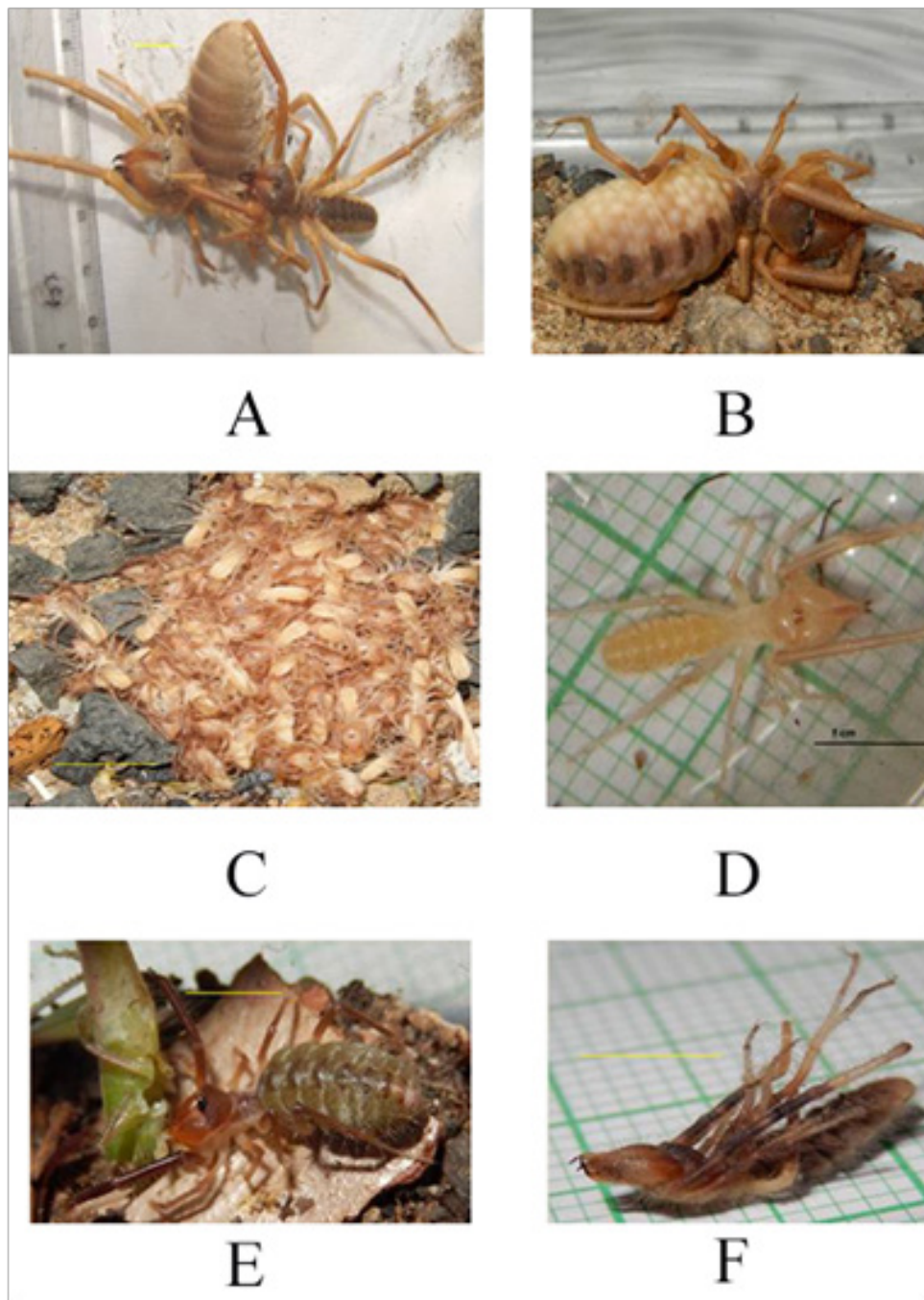


Figure 3: Life cycle of *G. fatalis* in the laboratory condition;

Image A: Copulation of Male & Female *Galeodes fatalis*;

Image B: Gravid female *G. fatalis*;

Image C: Nymphs in terrarium;

Image D: Separated nymph in plastic vial;

Image E: Second instar showing hunting behavior in the separated vial;

Image F: Juvenile ecdysed in the laboratory condition.





Figure 4: Development of nymphal stages to adult in *G. fatalis*.

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